

AUSTRALIAN SOCIETY
for LIMNOLOGY

Newsletter



Volume 11 Number 2

FOR PRIVATE CIRCULATION ONLY

AUSTRALIAN SOCIETY FOR LIMNOLOGY

NEWSLETTER

Vol. 11 No. 2

June 1973

EDITORIAL

With this issue, the newsletter passes into new hands, although Mike Geddes did do some of the groundwork for this issue. On behalf of all members, I'd like to propose a vote of thanks to Mike for the excellent job he has done since August 1972. I hope I am able to maintain the standards! With that, I should like to make the perennial plea of all newsletter editors everywhere: May I please have from you any information that might be included as 'items of interest', or perhaps short articles on issues related to the society's interests? It doesn't take long to scribble a note and send it off.

Keith Walker

Dept Environmental Biology

Research School of Biological Sciences

Australian National University

Canberra A.C.T. 2601.

JAMIESON IN RETROSPECT

The XII Congress at Jamieson was highly successful. Attendance is growing each year, and the Jamieson meeting probably was the largest so far. The pleasant mountain scenery around the town, and the most helpful management of the Courthouse Hotel, both contributed to a relaxed, happy atmosphere. The Annual Dinner and other social activities were, as always, enormous successes. Incidentally, it was wonderful to see Hilary Jolly among those present.

A highlight of the meeting was the diversity of the papers read, together with their uniformly high quality. The initial session, with papers by Bill Williams, Don Little, and Gene Likens, was exceptionally interesting. Lee Wyse's paper on production of fingerlings of Australian warm-water fishes generally was regarded as a considerable breakthrough in this field. Dave Pollard's heartfelt commentary on the repeated frustration of attempts to establish a National Park in the Northern Territory held the audience until well past the official finishing time. The joint paper by Jenny Lang and Jim Wharton about how not to obtain colour photographs of freshwater fishes was hilarious, and must go down as a classic.

The Sunday afternoon excursion to Snob's Creek was another highlight. Members were conducted around the Hatchery facilities by staff, and afterwards treated to a magnificent dinner.

Many thanks to all those concerned with organizing the congress; you did a great job!

IT'S THAT TIME AGAIN!

The subscription period of the society was recently altered to cover July 1 to June 30 in successive years, and so your remittance for 1973-4 should be sent now. If you are a student member, the annual subscription is \$3, and if you are either an ordinary or affiliated member, the subscription is \$6. You might like to use the enclosed slip to accompany your remittance.

THE JOLLY AWARD

The Jolly Award has been instituted to commemorate the distinguished contribution to Australian limnology of our founder, Dr Hilary Jolly. The award is funded through a donation made to the ASL by Dr Jolly, and the intention is to honour, on an annual basis, individuals who in the opinion of a Selection Committee (appointed by the Executive) have made the most significant contributions to limnology in Australia. More details were given in the last issue of the newsletter.

Nominations for the 1973-4 Jolly Award are now invited, and should be sent to the Secretary-Treasurer (now Don Buckmaster), who will pass them along to the Selection Committee.

A-J-M-F-R

The Advisory Board of the Australian Journal of Marine and Freshwater Research has requested inclusion of a letter regarding the future of the journal. If you have not already responded to this circular, be sure to do so now; an insert is included to facilitate your reply. The Board's proposals could mean a real shot in the arm for Australian limnology and marine sciences. Most members will know that Bill Williams is on the Advisory Board, and consequently the society's interests are very well-represented. In fact Bill was a prime mover in shaping the proposals before us. Implementation of these proposals will, however, require enthusiastic support! How about it?

CSIRO

Editorial and Publication Section

372 Albert Street

EAST MELBOURNE

Vic, 3002.

June 1973

Dear Colleague

AUSTRALIAN MARINE SCIENCE AND LIMNOLOGY

The changing pattern of research in marine science and limnology suggests the need for some revision of Australian outlets for publication of research results. Revision is also suggested by the fact that a significant number of papers in these fields is published overseas. Whilst such a practice has much to commend it (and should, in part, continue), it is clearly to the advantage of Australian marine scientists and limnologists to have a flourishing Australian journal designed to cater specifically for their regional requirements. The Advisory Committee of the *Australian Journal of Marine and Freshwater Research* is investigating the extent of revision required and would be particularly interested to know your reaction to the following proposals.

- (1) That the scope of the *Australian Journal of Marine and Freshwater Research* should be widened to include original research in all aspects of marine science and limnology covering relevant work in biology (including fisheries biology), chemistry, geology, and geophysics, and physical oceanography, that relates to the Australian region, the Indo-West Pacific Ocean and southern waters.
- (2) That apart from full research papers, short contributions describing an apparatus or technique should be accepted if they present a new principle or a significant modification of known methods. Short communications should also be acceptable if they are in the nature of complete papers of limited scope (but not merely isolated factual notes).
- (3) That the Journal should appear in two parts, Series A: Marine Research and Series B: Limnology. These would normally appear alternately at quarterly intervals so that a paper could be expected to be published in about 4-9 months from acceptance.

It is emphasized that all contributions will continue to be refereed and even with an extended coverage there is no intention to change the Journal's standards which have

been built up steadily over more than twenty years.

As an incentive to contributors and their parent institutions 200 reprints of each paper will be available free. This will encourage authors to submit work for publication whilst circulation of the Journal to a wider audience is being built up. In company with the other Australian Journals of Scientific Research, covers are being redesigned to make them more visually appealing.

It is hoped that all members of the Australian Marine Sciences Association and the Australian Society for Limnology will support the new style Journal wholeheartedly.

I should be grateful if you would spare the time to complete the enclosed form and return it to the address above.

Yours sincerely

D.J. Rochford
Chairman, Advisory Committee,
A.J.M.F.R.

Professor Gene Likens of Cornell University was a welcome visitor (and invited speaker) at the Jamieson meeting, and gave a very stimulating paper on the subject of land-water interactions. He spent a six-month sabbatical at ANU, and returned to the U.S. soon after the meeting. Although Gene doesn't yet know it, he was made an Honorary Member of the ASL by the incoming Executive Committee.

At the request of the Executive Committee, Don McMichael has taken a critical look at the Constitution of the Australian Society for Limnology. His work resulted in a redraft incorporating proposals intended to accommodate -

- (a) the new category of Sustaining Member,
- (b) the revision of the period of the subscription year (now July 1 to June 30), and
- (c) clarification of certain existing provisions, without any significant alteration in their nature.

The redrafted version has been slightly rearranged to provide a more logical sequence, and the clauses have been titled and renumbered. The XII AGM accepted the revision with only minor changes.

Mike Geddes would like to draw attention to the voting rights of Student Members who, according to clause 5, do not have the right to vote. In fact it has been accepted practice in the Society that Student Members may vote on all issues, and this has even been extended to voting rights for students on the Executive Committee. Mike therefore suggests the appropriate section should be amended. Any other suggested changes should be submitted to the Executive Committee in accordance with Clause 13.

THE AUSTRALIAN SOCIETY FOR LIMNOLOGY

REVISED CONSTITUTION

(Adopted at Annual General Meeting,
13th May, 1973, Jamieson, Victoria.)

1. Name: The name of the Society shall be the Australian Society for Limnology.
2. Objectives: The objectives of the Society shall be to establish effective liaison between all persons interested in any aspect of fresh and brackish water research in Australia, and to promote their study, and to encourage these interests in State and Commonwealth Research Institutes and Departments, and educational Institutions.
3. Means of Attaining Objectives: The following means may be used to attain the objective of the Society:
 - (a) The establishment and maintenance of a register of all persons working in fields relevant to Limnology in Australia and adjoining countries, giving details of their current interests and relevant publications.
 - (b) The holding of an Annual Congress which will coincide with the Annual General Meeting.
 - (c) The production of a Newsletter (which shall be distributed to all financial Members and all Honorary and Sustaining Members) by an editor to be appointed by the Executive Committee.

- (d) The publication of any scientific or other information relevant to the objectives of the Society. Scientific material shall, before publication by the Society, be considered and approved by an editorial board of at least two members appointed annually by the Executive Committee.
- (e) The encouragement of interest in limnology and support for the Society by the granting of awards and by recognition of supporters through special categories of membership.

4. Membership

- (a) The members of the Society shall be:
 - (i) Ordinary members who shall be persons admitted to membership by the Executive Committee, who shall pay such annual subscriptions as shall be fixed from time to time.
 - (ii) Student members who shall be University undergraduates or scholars at any educational Institution, who shall pay such annual subscription as shall be fixed from time to time.
 - (iii) Honorary members who may be elected for a limited specific period by the Executive Committee.
 - (iv) Honorary Life members who may be appointed at an annual general meeting on the recommendation of the Executive Committee.
 - (v) Sustaining members, who may be individuals, companies or organizations, admitted as such, by the Executive Committee, in accordance with the following requirements, and have the privileges indicated below -
 - (i) Any individual, company or organization contributing the sum of \$50.00 or more in any one year shall be eligible for admission as a Sustaining Member.

- (ii) Sustaining Members who are companies or organisations shall have the right to nominate two persons who shall enjoy all the privileges of ordinary members, including the right to vote, but not to hold office, while Sustaining membership is current
 - (iii) Sustaining members shall be acknowledged in all official publications of the Society for a period of 12 months from the date of their contribution, and in any other manner as the Executive Committee may from time to time decide
 - (vi) The Executive Committee may, in its absolute discretion, refuse admittance to any classification of membership, and shall be under no obligation to give any reason to any person, for its decision not to elect any candidate.
 - (b) Affiliated Bodies, Incorporated or unincorporated bodies and other organizations approved by the Committee may become affiliated with the Society on acceptance by the Executive Committee and on payment of such annual subscription as may be fixed from time to time.
 - (c) A register of members and affiliated bodies shall be kept by the Secretary-Treasurer.
5. Voting: Each Ordinary member and each of the nominees of Sustaining members shall be entitled to one vote at a General Meeting or in a postal ballot and each Affiliated Body shall have the right to appoint a delegate who shall be entitled to one vote at a General Meeting or in a postal ballot. Student and Honorary members shall not have the right to vote. All votes shall be cast personally and not by proxy.
6. Annual Subscription: The Annual Subscription shall be due on the 1st July in each year and the amount shall be fixed at the preceding Annual General Meeting. Members whose subscriptions are not paid by the succeeding 31st December shall be unfinancial and shall forfeit all rights and privileges of Membership forthwith.
7. Rights of Members: All financial members are entitled to receive current issues of the Society's Newsletter

scientific and other publications free of charge, and to attend all general meetings of the Society.

8. Management: The Society shall be managed by an EXecutive Committee consisting of the President, the immediate Past President (ex officio), the Vice President and the Secretary-Treasurer, together with not less than 5 and no more than 8 other members, all of whom shall be elected at the Annual General Meeting. This Executive Committee shall implement the Society's general business, and a simple majority shall decide all questions at Executive Committee Meetings. If voting is equal, a motion is lost. A quorum at Executive Committee Meetings shall be 4.
9. Finance: The financial year of the Society shall cover the period from the 1st May in any year to the 30 th April in the next ensuing year.
 - (a) All funds received by the Society shall be banked in the name of the Society. Separate accounts may be established for specific purposes at the discretion of the Executive Committee. A Publication Fund shall be maintained, to which shall be credited all contributions received from Sustaining Members, together with any gifts specifically given for purposes of publications, and any monies from the general account of the Society transferred to such fund by resolution of the Executive Committee.
 - (b) All bills and accounts shall be certified as to their correctness by the Secretary-Treasurer, and shall be paid by cheque. All cheques shall be signed by any two of the President, Vice-President and Secretary-Treasurer.
 - (c) No bill or account shall be paid without the prior approval of the Executive Committee, which approval may be obtained at a meeting of the Committee or by mail. Expenditure of a general nature may be approved in advance during any one financial year. Any commitment to expenditure entered into by the Executive Committee which has not been paid by the date of the Annual General Meeting shall be drawn to the attention of the Annual General Meeting in the Financial Statement together with any amounts owing to the Society.

10. General Meetings of the Society: The A.G.M. shall determine the date and place for the next Annual General Meeting. A special General Meeting may be called at the discretion of the Executive Committee and shall be summoned as soon as practicable following receipt of a request to do so signed by not less than twenty (20) members entitled to vote. Special General Meetings shall be called by notice in writing, specifying the business to be considered, and notices must be posted to all financial members not less than fourteen (14) days prior to the proposed date. No business shall be conducted at any Special General Meeting other than that specified in the notice convening the Meeting.
11. Quorum for General Meetings: At all General Meetings, twenty (20) members entitled to vote shall constitute a quorum, and a simple majority shall carry a motion.
12. Annual Reports: An Annual Report and Financial Statement shall be submitted to the Annual General Meeting, and the Financial Statement shall be audited by a person appointed at the previous Annual General Meeting. In the event that the Annual General is held prior to the end of the financial year, a separate Financial Statement covering the period of the financial year shall be prepared by the Secretary Treasurer and the auditor shall certify as to its correctness. Such audited report shall then be published in the Newsletter, or otherwise distributed to members as soon as practicable after the close of the financial year.
13. Amendments to the Constitution: Amendments may be made to the Constitution of the Society at an Annual General Meeting or at a Special General Meeting, or by a postal vote. Any proposed amendments shall be submitted in writing over the signature of any two members to the Executive Committee which shall either -
 - (a) refer them for consideration at the next ensuing Annual General Meeting, or
 - (b) call a Special General Meeting, for the purpose of considering the proposed amendments, or
 - (c) conduct a postal ballot of all financial members.A proposed amendment shall be carried by a two thirds majority of votes polled. At least two weeks notice shall be given to all members by the Executive Committee of any proposed changes to the Constitution.

14. Winding-up of Society: The Society shall not be wound up except on a two-thirds vote in favour of doing so at an Annual General Meeting or a Special General Meeting called for this purpose and in either case at least two weeks notice of the proposal shall have been given to all financial members, but shall be dissolved in the event of membership being less than 5 persons. The last General Meeting shall decide how the assets of the Society shall be disposed of, but this must be done in accordance with the aims of the Society and members shall not receive any benefit.

INTERNATIONAL BIOLOGICAL PROGRAMME

REPORT OF THE AUSTRALIAN SUBCOMMITTEE FOR IBP(PF)

July 1972

This report will already be known to some members, but for those who may be interested, it is reproduced here in full. Note that a few alterations have been made at the request of the authors concerned.

PREFACE

Phase 1 of IBP (1964-1967) was concerned with the definition of the aims, ideals and content of the Programme. This was published in 1964 (IBP News No. 2) and the objectives of Section PF were defined as "to study the basic factors of production and metabolism, at all trophic levels, in standing and running waters, both natural and polluted." Comment on this was invited and many countries, particularly limnologically advanced countries such as U.S.A. and the U.K., claimed that the Programme was too big and too ambitious, too vague, and premature since concepts and methods were not sufficiently developed. Further criticism pointed out that many less-developed countries had neither the technical and human resources to carry out such a plan nor any basic knowledge of their freshwater habitats on which to base studies. In those countries a "general advance in hydrobiological exploration" (Annex 2, IBP News No. 2) rather than an advanced programme was called for. Though the outstanding theme of PF is still the process of fixation of solar energy and the traffic of this energy through the complex aquatic ecosystem, the programme has been modified to include any advance in the understanding of the process of biological production in water, the reasonable management of freshwater resources, the provision of clean water, the prevention of pollution and the production of food. The reorganization of thinking coincided with the development of the "Theme" concept, in which each Section is divided into a number of topics of special concern or with large participation.

In Australia, freshwater ecology has been largely neglected until recent times. Certain aspects of the science, such as fisheries management, have been treated in some detail but there has been no history of research into all aspects of limnology. Even today, the identification of most of the invertebrates of Australian lakes and rivers presents major problems. Only a few samples of freshwater algae have been investigated, mainly by itinerant European scientists in the nineteenth century. In 1964, then, Australia could not be regarded as anything other than a developing country so far as limnology was concerned. As a result, a modest programme of Australian participation in IBP(PF) was envisaged, the underlying rationale being the need to start at the bottom of the 'pyramid' and to provide a basic limnological framework, rather than attempt more ambitious programmes based on uncertain foundations. Taxonomy and lake typology, therefore, figured prominently in early projects and even studies of the basic physiology of aquatic invertebrates was considered to fall within "a general advance in hydrobiological exploration." Subsequently, some projects expanded to include central and peripheral Themes of IBP(PF).

Apart from historical antecedents, a number of other reasons explain the modesty of the Australian Programme. Principally, there was a lack of significant national financial support; finance for individual projects was entirely the responsibility of the participant's institution (many of the projects formed part of research activities for university higher degrees). Further, there was (and is) no central Australian organization which is primarily concerned with the investigation of inland waters, and which could function as a focal point for coordination and support. To a considerable extent, the central (London) office of IBP(PF) with co-ordinator Dr. Julian Rzoska fulfilled the role that might have been played by such a central Australian organization, as also did in part the Australian national committee for IBP with chairman Sir Otto Frankel.

Until June 1969, coordination of Australian IBP(PF) projects was undertaken in conjunction with IBP(PM) projects. Increased interest in PF projects led to a separation into PF and PM projects, and a new subcommittee was set up to coordinate PF projects. It consisted of Mr. J.S. Lake (University of Sydney, now Department Forestry, Fisheries, Wildlife and National Parks, N.T.), Dr. P.A. Tyler (University of Tasmania), Dr. A.H. Weatherley (A.N.U.), and Dr. W.D. Williams (Monash University) (Chairman).

REPORTS

AUSTRALIA/PF/1

A study on highland lakes in Tasmania. Algal distribution in relation to chemical and physical factors; south temperate zone. P.A. Tyler, Department of Botany, University of Tasmania, Hobart. For all publications resulting from this project see Publications section.

1. Taxonomy of freshwater plankton

(a) Phytoplankton samples were taken from a series of Central Plateau lakes for a period of five years. All major genera were identified and also most species. Since for ecological purposes recognition of a taxon is sufficient, the systematics were given low priority and it may be some years before publication of all data.

(b) The distribution of zooplankton in Central Plateau lakes was investigated. The zooplankters Daphnia carinata, Ceriodaphnia quarangula, Bosmina meridionalis and Mesocyclops leuckartii are cosmopolitan. Various species of Boeckella and Calamoecia are restricted to certain lakes in a somewhat curious way.

2. Phytoplankton ecology

Detailed investigations of the seasonal cycles of phytoplankton, and of physical and chemical limnology, of Lakes Sorell, Crescent and Woods, on the Central Plateau, were undertaken by postgraduate students under

supervision. All three lakes are shallow, turbid and thoroughly homogeneous. Lakes Sorell and Crescent are a contrasting pair situated less than half a mile apart in an identical geological situation. Monthly sampling was carried out for over two years and the limnological and biological conditions of these lakes are now comparatively well-known. Studies of the primary production by phytoplankton followed and are now complete.

3. Zooplankton ecology

Monthly sampling was carried out for 15 months on two contrasting lakes, Sorell and Crescent. The reproducibility of several generally used zooplankton methods was investigated, with somewhat disturbing results. Zooplankton studies were subsequently discontinued.

4. Preliminary survey of unexplored lakes

Many of Tasmania's lakes lie in remote, inhospitable mountains and nothing is known of their conditions. Some of the lakes are remote enough to have remained free from introduced trout. Under a grant from the Australian Research Grants Commission a preliminary survey of all Tasmania's lakes was made. Remote lakes were reached by helicopter. Their bathymetry, geomorphology, physicochemical limnology and biology were investigated on the basis of one three-day visit to each group of lakes: Colleague Dr. J.A. Townrow cored adjacent bogs and filled-in glacial lakes for post-pleistocene palaeolimnology.

5. Applied limnology

The limnology and microbiology of manganese in lakes and distribution systems.

The role of bacteria in precipitating manganese in pipelines was investigated with colleague Dr. K.C. Marshall. Manganese oxidation and the biology of the causative organisms was investigated, and, under a Nuffield Foundation grant, work on the source and chemical cycles of manganese in Tasmanian lakes was undertaken by a postgraduate student under supervision.

6. Primary productivity in Tasmanian lakes

A grant from the Australian Institute of Nuclear Science and Engineering allowed work on primary productivity. The lakes studied were Lakes Sorell, Crescent and Woods, for which lakes plankton conditions had been documented in detail. The work was carried out by postgraduate student Mr. Cheng.

AUSTRALIA/PF/2

Plankton in lakes in western Victoria. Standing crops of net plankton over a wide range of salinity; south temperate zone. S.E. Australia-Victoria. S.U. Hussainy, Department of Zoology, Monash University. The participant was a Ph.D. candidate under the supervision of Dr. W.D. Williams.

The ecology of the microbiota was studied in ten lakes over a wide range of salinity in western Victoria. The study began in November 1966 and lasted until August 1969. Lakes within a salinity range of 0.42-320.0 gm/l were studied.

The lakes exhibited wide seasonal fluctuations in total dissolved solids, the highest concentrations being in summer, the lowest in winter. Lakes Pink, Weering and Cundare were dry in summer with a thick crust of salt on the bottom. There was no chemical stratification in any of the lakes.

Analyses of water for their ionic composition revealed a distinct ionic homogeneity. In all cases, sodium dominated the cations, and chloride the anions. Except in Lakes Purrumbete, Elingamite, and Keilambete, which contained more calcium than potassium, the order of cationic dominance was $\text{Na}^+ > \text{Mg}^{+2} > \text{K}^+ > \text{Ca}^{+2}$. Sulphate was usually present in relatively small quantities. The anionic dominance was $\text{Cl}^- > \text{HCO}_3^- > \text{SO}_4^{+2}$. In Bullenmerri sulphate was not detected on any occasion.

Wide fluctuations in water temperatures were recorded. Lakes Purrumbete, Bullenmerri and Gnotuk stratify during summer and are isothermal during late winter and early spring. The annual heat budget was estimated for several lakes.

The pH in the freshwater lakes was influenced by algal activity. Saline lakes, however, were well buffered and photosynthetic activity had very little effect on their pH. Marl deposition was seen in the littoral regions of Lakes Keilambete and Gnotuk.

The surface waters were supersaturated with dissolved oxygen both during summer and winter. During winter the oxygen stratification approached a near orthograde condition, and, in summer, a clinograde curve with a depletion in the hypolimnion.

Orthophosphate and nitrate nitrogen varied from 20-1,800 mg/m³ and 0.036-150.03 mg/l (36-150,030 mg/m³) respectively. During wet months of the year phosphate and nitrate were contributed through storm water (run-off). They do not seem to limit algal production. The concentration of phosphate was always more than the concentration known for eutrophic lakes.

Chlorophyll a was determined to estimate the standing crops. The species composition of algae was investigated. Based on high chlorophyll values the lakes are classified as eutrophic. Lake Corangamite, with a permanent bloom of Nodularia, is considered as a hyper-eutrophic lake.

The species composition of zooplankton during different months of the year was investigated. Total dissolved solids have a significant positive effect on zooplankton standing crop. However, it has an inverse effect on species diversity.

Congeneric occurrences were recorded among Copepods, Cladocera and Rotifera. The mechanism operating and permitting the coexistence of the allied species seems to be the differences in body size.

Fluctuation in body size and egg production in these species of calanoid Copepoda were investigated. Food has a positive effect on growth and reproduction, whereas temperature and total dissolved solids have a negative one. The effect seems to vary from species to species, and for a given species from locality to locality. Depth of locality also seems to have an inverse effect on body size and egg production.

Studies on the recolonization of zooplankton in temporary localities revealed that Parartemia zietziana was the first to colonize. As the salinity decreased many species appeared and completed their life cycle before the onset of adverse conditions. Calamoecia clitellata was the last to appear. It coexisted with C. salina for about a month. With the increase in salinity and temperature both the species disappeared. Parartemia zietziana was the last to disappear from the environment.

Studies on the taxonomy, development of Gomphocythere australica, and its relevance to the continental drift hypothesis were carried out. The male of Candonocypris assimilis was also described.

AUSTRALIA/PF/3

This project was subsequently excluded from IBP(PF); it was considered more appropriately located in IBP(PM).

AUSTRALIA/PF/4

Taxonomic and ecological studies on the freshwater gastropods. Victoria, Australia. B.J. Smith, National Museum, Russell Street, Melbourne 3000.

Although some preliminary work was undertaken in this project, the project is incomplete and there is no report to hand.

AUSTRALIA/PF/5

Polymorphism and ecophysiology of certain calanoid copepods. Inland saline lakes, Australia. G. Brand, Department of Zoology, Monash University. The participant was a Ph.D. candidate under the supervision of Dr. I.A.E. Bayly.

A study was made of aspects of ecological differentiation in a euryhaline group of calanoid copepods, the family Centropagidae, which is particularly well represented in Australian inland and estuarine waters. Differences in both salinity and ionic tolerances were examined for within and between a number of species, evidence being obtained that restrictions of both capabilities contributed to the group's contemporary distribution. The ability of estuarine species to regulate hypo-osmotically at high salinities and of these and other species to regulate hyperosmotically in more dilute media, was established or reaffirmed as was the lack of regulation in two salt-lake species. These results were considered from an adaptive and phylogenetic viewpoint with reference being given to the origin of the inland saline lake representatives. In one of the latter, reproductive adaptations to impermanence of the environment were also investigated. This species was variable in its pigmentation and in regard to certain structures of the metasome and swimming legs. The possible adaptive significance of alternative phenotypes, suggested by their occurrence in relation to the species' enormous salinity range, was examined experimentally involving the maintenance of laboratory cultures. None of the differences appeared to be genetically based and the intrinsic or extrinsic controlling factors remain ill-defined, as do their functional significance.

AUSTRALIA/PF/6

Limnology of a shallow saline chlorocarbonate lake with special reference to production. Saline lake, Werowrap, Victoria. K. Walker, Department of Zoology, Monash University. The participant was a Ph.D. candidate under the supervision of Dr. W.D. Williams.

A comprehensive ecological study of a saline crater lake was made over three years. Saline lakes are in many respects simple, natural models of ecosystem structure and function.

The lake is shallow and small in area accounting for about 36 per cent of the total catchment. The watershed is steep pasture land.

Meteorological data were used to compute the analytical heat budget of the lake for two years. The sediments were shown to be an important factor in the lake thermal regime.

A study of the hydrological balance demonstrated the fluctuating balance between evaporation and rainfall to be the major determinant of the salinity and depth of the lake. Inflowing seepage, and probably outflowing seepage, are implicated. The lake salinity increased about two-fold over the three years, ranging between 25 and 56 g/liter.

Optical measurements indicated a rapid attenuation of light due to high turbidity. Secchi disc data varied seasonally with plankton abundances.

Chemical analyses showed a stable ionic composition despite salinity variations. The dominant ions are Na^+ , K^+ , Cl^- , HCO_3^- and CO_3^{2-} . The water is highly alkaline, with a sustained pH of about 9.8. The groundwater showed chemical similarities with the lake, and seepage is clearly the major source of salts.

Inorganic P and N levels were high and were influenced seasonally by a gull population breeding on a small island in the lake.

Analyses for minor elements suggested that the chemical nature of the lake water renders a number of trace elements largely insoluble, although they appeared not to be limiting factors.

The phytoplankton community was monitored by determinations of cell concentrations, pigments, and also productivity, using the carbon 14 and oxygen light and dark bottle methods. Attention was given to the derivation of daily productivity estimates from short-term experiments.

The Winkler method for oxygen determination is ineffective in highly carbonate waters, and the Miller method was used as an alternative.

The seasonal composition of the phytoplankton varied with salinity. In summer and autumn 1968, 1969, the dominant phytoplankton was Anabaena spiroides. After winter 1969 Gymnodinium aeruginosum and Chroococcus (?) sp. were dominant. Gymnodinium aeruginosum differed from other species in persisting throughout the seasonal cycle, although changes in its appearance and size were observed.

The trophic status of each phytoplankton species was considered. Laboratory nutrient enrichment experiments with G. aeruginosum demonstrated strong stimulation by organic material and N compounds.

The lake phytoplankton was very highly productive. The annual carbon 14 productivity (435 g C/m²) appears to be the highest figure recorded for any natural (unpolluted) lake. Carbon 14 and oxygen productivity results are compared.

Heterotrophic bacterial activity in the lake was indicated by unusually high rates of "dark" carbon assimilation. On an annual basis bacterial productivity appeared greatly to exceed that of the phytoplankton.

Investigations of the littoral biota were limited to qualitative assessments of species abundance and determinations of "Aufwuchs" productivity (in 1968-1969). It was concluded that periphytic productivity was likely to have been important only in spring 1968.

The population dynamics of the dominant zooplankter, Brachionus plicatilis, were followed using the eggs/female ratio as an indication of reproductive status. The trophic relationships of zooplankton species are discussed.

Benthic organisms were exclusively Tanytarsus barbitarsis. Incomplete productivity data suggest that the lake has the most productive benthic community yet recorded. Tanytarsus barbitarsis, like other consumer species in the lake, probably utilizes detritus and bacteria as a major source of nutrition.

Calorific data were obtained for some species and were used to estimate the seasonal efficiency of light utilization by the phytoplankton.

The lake ecosystem in toto is considered in a final discussion.

AUSTRALIA/PF/7

Net and gross production of crayfish Cherax albidus in farm dams. Respirometry. Farm dam ponds, New South Wales. D.J. Woodland, Zoology Department, University of New England.

Research in the field of eco-energetics has been directed almost solely towards describing the metabolism of communities. The integrity of populations has been largely ignored in studies of this kind. On the other hand, ecological studies focussed on single species populations have tended to avoid considerations of energy flux through the populations. An understanding of the growth and regulation of animal populations has been achieved with virtually no reference to energy utilization. This deficiency may be restricting our understanding of the dynamics of populations. With this in mind the participant began a population study. A population of freshwater crayfish Cherax albidus has been used as a vehicle for the study. As a first step it was necessary to discover something about the basic biology of the species, e.g. food, habits, predators, and so on. The second step has been to assess the numbers and biomass dynamics of the population. This has been done in detail with the intention of translating the data into calorific units with more precision than has been done in this report. Some preliminary estimates have been made of the contribution of crayfish of different ages to the total energy flux of the population, and some consideration has been given to seasonal changes in energy flux. These results have not been treated in any depth since the data on metabolic rates and caloric content of tissues need to be refined. However, the metabolism of the population has been calculated along the lines used for incorporating the data into a classical community energetics study.

1. C. albidus thrives in agricultural dams excavated in clay soils; but is virtually absent from those clear water dams characteristic of basaltic soils. The former lack higher plants, and there is evidence that this is due to the activities of C. albidus.
2. Dissolved oxygen levels on the bottoms of these dams can be around four per cent air saturation.
3. Large crayfish preferred shallower water, where pO_2 s are higher, but crayfish were found at all depths. Crayfish abundance was generally higher in shallower waters.
4. The preferred food of C. albidus is fresh or decaying animal tissue, but their diet is principally detritus since that is the only food item readily available.
5. The only definite predator of the population was the cormorant, Phalacrocorax melanoleucos, which preferred medium sized, or large moulting crayfish. Their predation was spasmodic.
6. C. albidus does not appear to emigrate though small crayfish may be swept down temporary watercourses after flooding.
7. C. albidus make burrows (which are occupied by one individual), but in some dams the consistency of the substrate will not support a burrow. Populations still thrive when burrows are denied.
8. C. albidus has a maximum life span of about three years.
9. Males grow to a larger size than females. In the study population, one year old crayfish had a mean carapace length of about 30 mm; two year old males about 55 mm; two and three year old females about 45 mm; and three year old males about 60 mm. This difference in growth rate between the sexes is not due entirely to the extra energy cost of producing eggs, part of it is due to the cost to the female of rearing young.
10. Maximum sizes and hence, probably, growth rates are greater in some populations than others. This is, no doubt, correlated with population density.
11. Statistically, there were significantly more females than males in the study population, but the departure from a 50:50 sex ratio may not have been biologically significant.
12. 'Intersexes' were very common in some populations but these animals appeared to be functional males.

13. Females spawned when two years old and most probably spawn only once. There appeared to be only one spawning season - commencing in October, and tailing-off in December. Females nurse the young on their pleopods till the third instar stage - a period of about two months from egg to independence.
14. Individual and population fecundity were assessed.
15. Funnel traps were used to catch *C. albidus*. The sex ratio and size distribution of trapped catches do not indicate the sex ratio and size distribution in a population. Berried or nursing females, and smaller crayfish are less likely to be trapped; not because of trap avoidance, as such, but because these crayfish avoid contact with large crayfish. Cold torpor made part of the study population untrappable in winter. These and other factors were taken into consideration when mark-and-recapture methods were used to estimate population size.
16. Petersen estimates were made to determine the changes in size and sex composition of the study population throughout the year.
17. Mortality rates for all stages in the life cycle were ascertained.
18. Linear growth rates were determined from the recapture of marked crayfish, and these have also been converted to live weight growth.
19. Oxygen consumption rates were determined for crayfish at 10°C, 16°C, 18.5°C and 20°C.
20. Standing crop of the study population was exceptionally stable, at about 340 kg/ha, throughout the year. Net production was about 670 kg/ha. Males made a greater contribution to both these items, but not excessively more, since the population was dominated by sexually immature crayfish, and these made the most substantial contribution to biomass and production.
21. Part of net production by the study population was not estimated, in particular, that lost through amputation of appendages through fighting. Perhaps as much as five per cent of tissue growth met a premature death through amputation.
22. Some determinations of caloric content of tissue were made. Eggs had a caloric content of about 6,400 gcal/g ash free, freeze dried weight. Older animal tissue had an average caloric content of about 5,000 gcal/g ash free, freeze dried weight.

23. The population had an annual energy turnover (gross production) of 118,500 kcal divided between respiration, 54,000 kcal, and net production (underestimated) 64,500 kcal. On an areal, rate basis this resolved to 290 kcal/m²/yr, gross production, 132 kcal/m²/yr, respiration and 158 kcal/m²/yr, net production - generated by an average standing crop of 73 kcal/m².

24. Only about 1.4 per cent of net production went towards reproduction.

25. Net growth efficiency was estimated at only 26 per cent in summer, but at about 60 per cent at other times of the year. The yearly average of 54 per cent was much higher than that recorded for any other natural population. If anything, this figure should be an underestimate, not an overestimate.

26. Preliminary descriptions of the changing contribution of a year class with age to energy flow have been included.

27. Seasonal changes in the energy flow components for the whole population have been tabulated.

AUSTRALIA/PF/8

Quaternary vegetation history, volcanic lakes in Australia. Terang-Camperdown district, western basalt plains of Victoria, Australia. G.H. Yezdani, Department of Botany, Monash University. The participant was a Ph.D. candidate under the supervision of Dr. D. Churchill.

The newer volcanic plains of western Victoria are Pleistocene in age and have many lakes of volcanic and tectonic origin, which encompass an entire range of salinity from fresh-brackish-saline-brine.

The general vegetation is an open grassland, deficient in vascular plant species and tree cover. The dryland vegetation reflects the influence of both adaphic and biotic factors. The basaltic soil is largely responsible for the general paucity of the flora of these plains. However, the aquatic flora, especially in the freshwater lakes, is rich both in species and number of individuals. This study presents an outline of the extant aquatic micro and macroflora of the volcanic lakes region of western Victoria. The distribution of aquatic macrophytes is presented in vegetation maps of seven volcanic lakes and descriptions of six tectonic lakes. The composition of the phytoplankton communities of the western Victorian lakes and rivers, estuaries and a lagoon of Wilson's Promontory is given with particular emphasis on the members of the Chlorococcales. Various phytoplankton indices are used to present a tentative classification of the trophic status of the volcanic lakes. These indices show that most of the freshwater lakes are oligotrophic, and saline lakes are eutrophic. In the freshwater lakes dihalobous and alkaliphilous and indifferent diatoms dominate the diatomophytoplankton, whereas the saline lakes are dominated by euhalobous, mesohalobous, and alkaliphilous forms.

Cores from five volcanic lakes in the western District were taken. Stratigraphical, pollen, microplankton, diatom, macrofossil and organic matter analyses were made on the sediments. Historical and prehistorical changes in the vascular vegetation, phytoplankton, productivity, salinity and water-level are discussed in detail for Cobrico Swamp (freshwater) and Lakes Bullenmerri (brackish) and Gnotuk (saline). Three short cores from Saddler's Swamp, Lake Mumblin and Coorong Lagoon are also discussed.

Several pollen, microplankton and diatom diagrams are discussed. These cover the past 13,000 years. Absolute dating of the major vegetational and limnological events were obtained from seven radiocarbon dates.

In Cobrico, oligotrophic openwater conditions prevailed from 7800 B.C. to 6000 B.C. Transition from oligotrophy to eutrophy is indicated at 5600 B.C., followed by a long period of trophic equilibrium. A normal hydrarch succession began with openwater aquatics followed by shallow water aquatic plants, followed by sedges and rushes and finally in the formation of a Leptospermum fenwood.

No evidence of volcanic eruption was found in the Camperdown district of the western basalt plains of Victoria after 7080 $\pm$ 145 B.C. when volcanic ash, found in Lake Gnotuk, was deposited in the saline water of the crater lake. From 5400 B.C. to 4400 B.C. brackish water conditions existed. Then followed a freshwater phase from 4400 B.C. until 3600 B.C. This freshwater phase is interpreted as the result of increased precipitation. A "Clypeus Lagoon Flora", which reflects brackish water conditions, followed the freshwater phase and lasted from 3600 B.C. until 2800 B.C.; when conditions once more became saline. A period of maximum dryness from 1800 B.C. to 1600 B.C. is reflected in dolomite sedimentation. The freshwater and the dolomite phases are believed to represent regional wet and dry periods respectively, rather than strictly local effects.

In Lake Bullenmerri, freshwater conditions existed from 1500 B.C. until 1000 B.C., preceded by a brackish water phase and followed by a "Clypeus Lagoon" phase (during 1000 B.C.-200 B.C.). The freshwater and "Clypeus Lagoon" phases of Lakes Gnotuk and Bullenmerri were not synchronous in age. A similar "Clypeus Flora" is also found in the Coorong Lagoon (South Australia).

The general vegetation reflected in the pollen diagrams from all the localities investigated shows that an open landscape existed throughout, with local changes taking place within the crater basins. The upper 50 cm of sediment in the crater deposits contain pollen of plant species introduced by the Europeans following their settlement of the western District.

In addition to eight initial projects reported on above, a further three were later admitted. Results from these have mostly been published and so are not reported on in detail here (see Publications Section).

AUSTRALIA/PF/9

Taxonomy and ecology of freshwater fish. A.H. Weatherley, Department of Zoology, Australian National University.

AUSTRALIA/PF/10

Taxonomy and ecology of inland native fish. J.S. Lake, late of the School of Biological Sciences, University of Sydney; presently at the Department of Forestry, Fisheries, Wildlife and National Parks, N.T.

AUSTRALIA/PF/11

Taxonomy and ecology of Australian freshwater invertebrates; teaching of limnology; ecology of inland salt lakes.

PUBLICATIONS

- BAYLY I.A.E. and WILLIAMS W.D. (1972). "Inland Waters and their Ecology". Melbourne, Longmans.
- BERRA T.M. and WEATHERLEY A.H. (in press). A systematic study of the Australian freshwater serranid fish genus Maccullochella, Copeia.
- BRAND G.W. (1972). Studies on the physiology and ecology of some Australian calanoids (Crustacea: Copepoda). Ph.D. Thesis, Monash University, Melbourne.
- ELLIS P. and WILLIAMS W.D. (1970). The biology of Haloniscus searlei Chilton, an oniscoid isopod living in Australian salt lakes. Aust. J. mar. Freshwat. Res. 21:51-69.
- HUSSAINY S.U. (1969). Ecological studies on some microbiota of lakes in western Victoria. Ph.D. Thesis, Monash University, Melbourne.
- HUSSAINY S.U. (1969). A new species of Gomphocythere (Limnocytheridae, Ostracoda) from Australia. Proc. R. Soc. Vict. 82:299-304.
- HUSSAINY S.U. (1969). Description of the male of Candonocypris assimilis G.O. Sars 1894 (Cypridae, Ostracoda). Proc. R. Soc. Vict. 82:305-308.
- LAKE J.S. (1967). Rearing experiments with five species of Australian freshwater fishes. I. Inducement to spawning. Aust. J. mar. Freshwat. Res. 18:137-153.
- LAKE J.S. (1967). Rearing experiments with five species of Australian freshwater fishes. II. Morphogenesis and ontogeny. Aust. J. mar. Freshwat. Res. 18:155-173.
- LAKE J.S. (1971). "Freshwater Fishes and Rivers of Australia". Nelson (Australia).

- LAKE J.S. and MIDGLEY S.H. (1970). Australian Osteoglossidae (Teleostei). Aust. J. Sci. 32:442-443.
- LEE C.L. and WILLIAMS W.D. (1970). Meristic differences between two conspecific fish populations in Australian salt lakes. J. Fish. Biol. 2(1):55-56.
- LIM K.H. and WILLIAMS W.D. (1971). Ecology of Austrochiltonia subtenuis (Sayce) (Amphipoda:Hyalellidae). Crustaceana 20(1):19-24.
- LING H.U. and TYLER P.A. (in press). Zygospore germination in Pleurotaenium. Arch. Protistenk.
- LING H.U. and TYLER P.A. (in press). The process and morphology of conjugation in desmids, especially the genus Pleurotaenium. Br. phycol. J. 1.
- McKENZIE K.G. and HUSSAINY S.U. (1968). Relevance of a freshwater cytherid (Crustacea, Ostracoda) to the continental drift hypothesis. Nature, Lond. 220:806-808.
- THOMASSON K. and TYLER P.A. (in press). Taxonomy of Australian freshwater algae. II. Some planktic Staurostra from Tasmania. Nova Hedwigia.
- TYLER P.A. (1970). Taxonomy of Australian freshwater algae. I. The genus Micrasterias in south-eastern Australia. Br. phycol. J. 5: 211-234.
- TYLER P.A. (in press). Reconnaissance limnology of some sub-Antarctic islands. I. Chemistry of lake waters from Macquarie Island and the Iles Kerguelen. Int. Revue ges. Hydrobiol. Hydrogr.
- TYLER P.A. (in press). Limnological studies. In: W.D. Williams (ed.) "Biogeography and Ecology in Tasmania". Monographiae Biologicae. The Hague, Den Junk.
- TYLER P.A. and MARSHALL K.G. (1967). Microbial oxidation of manganese in hydro-electric pipelines. Antonie van leewenhoek J. Serol. Microbiol. 33:171-183.
- TYLER P.A. and MARSHALL K.C. (1967). Hyphomicrobia - a significant factor in manganese problems. J. Am. Wat. Wks Ass. 59:1043-1048.
- TYLER P.A. and MARSHALL K.C. (1967). Pleomorphy in stalked, budding bacteria. J. Bacteriol. 93:1132-1136.
- TYLER P.A. and MARSHALL K.C. (1967). Form and function in manganese-oxidizing bacteria. Arch. Mikrobiol. 56:344-353.
- WALKER K.F. (1971). Studies on a saline lake ecosystem. Ph.D. Thesis, Monash University, Melbourne.
- WALKER K.F., WILLIAMS W.D. and HAMMER U.T. (1970). The Miller method for oxygen determination as applied to saline lakes. Limnol. Oceanogr. 15:814-815.
- WEATHERLEY A.H. (1966). The ecology of fish growth. Nature, Lond. 212:1321-1324.

- WEATHERLEY A.H. (ed.) (1967). "Australian Inland Waters and their Fauna: Eleven Studies". Canberra, A.N.U. Press.
- WEATHERLEY A.H. (1970). Effects of superabundant oxygen on thermal tolerance of goldfish. Biol. Bull. 139:229-238.
- WEATHERLEY A.H. (1971). Fish and fisheries. In: A.B. Costin and H.J. Frith (eds) "Conservation". Victoria, Penguin.
- WEATHERLEY A.H. (1972). "Growth and Ecology of Fish Populations". London, Academic Press.
- WEATHERLEY A.H. (in press). Introduced fish. In: W.D. Williams (ed.) "Biogeography and Ecology in Tasmania". Monographiae Biologicae. The Hague, Den Junk.
- WEATHERLEY A.H. and LAKE J.S. (1967). Introduced fish species in Australian inland waters. In: A.H. Weatherley (ed.) "Australian Inland Waters and their Fauna: Eleven Studies". Canberra, A.N.U. Press.
- WILLIAMS W.D. (1967). The chemical characteristics of lentic surface waters in Australia. In: A.H. Weatherley (ed.) "Australian Inland Waters and their Fauna: Eleven Studies". Canberra, A.N.U. Press.
- WILLIAMS W.D. (1967). The changing limnological scene. Ibid.
- WILLIAMS W.D. (1967). Key to major groups of Crustacea occurring in Australian inland waters. Syncarida. Amphipoda. Isopoda. Decapoda (with J. Yaldwyn). In: I.A.E. Bayly, J.A. Bishop and I.D. Hiscock (eds) "An Illustrated Key to the Genera of the Crustacea of Australian Inland Waters". Aust. Soc. Limnol. Spec. Publ. 2:1, 2, 16-23, 30-34.
- WILLIAMS W.D. (1968). "Australian Freshwater Life: The Invertebrates of Australian Inland Waters". Melbourne, Sun Books.
- WILLIAMS W.D. (1968). The distribution of Triops and Lepidurus in Australia. Crustaceana 14(2):119-126.
- WILLIAMS W.D. (1969). Eutrophication of lakes. Proc. R. Soc. Vict. 83:17-26.
- WILLIAMS W.D. (1969). Energy transformations in salt lakes. Aust. Soc. Limnol. Bull. 1:9-12.
- WILLIAMS W.D. (1970). Salt lake ecosystems. Aust. Soc. Limnol. Bull. 3: 18-19.
- WILLIAMS W.D. (1970). Redescription of Haloniscus searlei Chilton (Isopoda:Oniscoidea:Oniscidae) from an Australian salt lake. Crustaceana 19(3):311-319.
- WILLIAMS W.D. (in press). The uniqueness of salt lake ecosystems. Proc. UNESCO/IBP Symposium, Productivity Problems of Freshwaters, Polish Academy of Science.

- WILLIAMS W.D. (in press). Man-made lakes and the changing limnological environment in Australia. Proc. Symposium on Man-Made Lakes, International Council of Scientific Unions, Tennessee, 1971.
- WILLIAMS W.D. (in press). Freshwater Crustacea. In: W.D. Williams (ed.) "Biogeography and Ecology in Tasmania". Monographiae Biologicae. The Hague, Den Junk.
- WILLIAMS W.D. and HANG FONG WAN (in press). Some distinctive features of Australian inland waters. Water Research.
- WILLIAMS W.D., WALKER K.F. and BRAND G.W. (1970). Chemical composition of some inland surface waters and lake deposits of New South Wales, Australia. Aust. J. mar. Freshwat. Res. 21:103-116.
- WOODLAND D.J. (1970). Population study of a freshwater crayfish, Cherax albidus Clark. Ph.D. Thesis, University of New England.
- YEZDANI G.H. (1970). A study of the Quaternary vegetation history in the volcanic lakes region of western Victoria. Ph.D. Thesis, Monash University, Melbourne.

P R O J E C T A Q U A

This project was supported; Drs Tyler, Weatherley and Williams (and Mr. Timms and Dr. Costin) provided information.

The following localities were proposed as sites worthy of conservation (for details see LUTHER H. and RZOSKA J. (1971): Project Aqua: A source book of inland waters proposed for conservation. IBP Handbook No. 21.): Lake Tarli Karng (Vic.), Anabranh Lakes of Hattah Lakes system (Vic.), Lake Gnotuk (Vic.), Lake Eyre (South Aust.), Salt lakes between Robe and Beachport (South Aust.), Lake Corangamite (Vic.), Red Rock Lake Complex (Vic.), Little Llangothlin Lagoon (N.S.W.), Lakes Hiawatha and Minnie Water (N.S.W.), The Gap Lagoons (N.S.W.), Lakes Eacham, Barrine, Euramoo and The Crater (Qld), Lakes Blue, Cootapatamka, Albina, Hedley Tarn and Club Lake (N.S.W.), Lake Seal (Tas.), Lake St. Clair (Tas.), Lakes Sorell and Crescent (Tas.), Lagoon of Islands (Tas.), Lake Pedder (Tas.), Lake Judd (Tas.), Lake Fergus or Lake Ada (Tas.), Macquarie Island (Tas.).

BOOKS

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Ponds and Lakes. T.T. Macan 1973. George Allen & Unwin Ltd.,
London. 148 p. Recommended \$5.30 (paper ed.)

An enjoyable, well-written little book attempting to bridge the gap between the professional ecologist and his/her amateur counterpart. The main subject matter- ecology of ponds - has a special relevance for Australia, where farm dams and the like must surely be the most abundant kind of freshwater locality. From the fly-leaf:

'Presents an account of life in ponds and lakes and indicates field projects that might feasibly be undertaken by students. It will be particularly valuable for those who intend to pursue small projects in the course of school or university studies.

The major topics covered are physical, chemical and biological processes; animals and plants with stress on their adaptations and life histories; the inter-relationships between the organisms and their reactions to physical and chemical factors in the environment. In keeping with the author's main aim of providing projects within the competence of students, aspects that can be investigated only in research laboratories are discussed briefly for the sake of completeness, and aspects that can be demonstrated or investigated by students are treated more fully. The living organism in its environment rather than in an experimental container indoors is kept well to the fore. Ponds receive more attention than lakes, though less is known about them, partly because few students work near a lake and partly because a large body of water needs facilities unlikely to be available. Ponds can be modified experimentally and many undergo modification in the natural course of many human activities, and often some requirement unrelated to biological study leads to an experiment far more costly than any that biologists could afford.'

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Animal life in fresh water. Helen Mellanby. 1968.

3rd edition, Chapman and Hall, London.

320 p. \$5.95 (cloth ed.).

This text describes all the forms of fresh-water invertebrate animals commonly found in Britain, together with their life-histories and distribution. The numerous line drawings cover every common type and will assist the identification of most macroscopic specimens in regard to their genus. The book has been written in the most elementary terms and assumes a minimal knowledge of animal structure and classification. For this reason, it should be found useful to the amateur natural historian for whom few similar textbooks exist, as well as to university undergraduates and graduates whose work has been restricted to the laboratory. The present edition has undergone a good deal of revision.

Problems of ecology: Sampling animal populations in aquatic environments. M. Lamotte and F. Bourliere (eds.). Masson, Paris. 294 p.

An extensive review of methods and apparatus, slanted toward marine sciences. French text.

AUSTRALIAN SOCIETY FOR LIMNOLOGY

Minutes of the Fifth Meeting of the Executive Committee held at Monash University at 9 am on the 13th April 1973.

1. Present:

Mr. G. Arnott, Dr. I.D. Hiscock, Dr. D.F. McMichael, Mr. J.C. Wharton (Secretary-Treasurer), Dr. W.D. Williams (President).

2. Apologies:

Dr. D.D. Francois, Mr. M. Geddes, Mr. D.D. Lynch, Dr. S. McGill, Mr. H. Midgley, Mr. N. Ruello and Mr. R. Tilzey.

3. Confirmation of Minutes:

The Minutes of the Fourth Meeting which had been circulated were confirmed.

4. Accounts:

The Secretary-Treasurer reported that the Society's General Account had a credit balance of \$1543.90 and that the Publications Account was \$87.00 in credit.

5. Matters Arising from Minutes:

(a) New Directory.

After some discussion on the type of printing process to be employed, it was agreed that Mr. Arnott should type the Directory information on an IBM machine and that Dr. Hiscock would arrange for the off-set printing of 500 copies with Charles E. Tully Pty Ltd of Huntingdale.

(b) Natural History Medallion.

The President reported that he had contacted Dr. Riek who was at present overseas in relation to information required by the Nomination Committee and he had received a reply. He hoped to finalize nomination papers with the Committee in the near future.

(c) Sustaining Membership.

It was agreed to refer the Sub-Committee recommendations re Sustaining Membership to the AGM with a strong endorsement. Constitutional changes would be necessary to create a new membership class.

(d) The Jolly Award.

The Committee discussed the question of a book plate and agreed upon a design. The Secretary-Treasurer was asked to forward details of the design to Mr. Tilzey and to ask for perhaps two conceptual drawings.

(e) Expected attendance at AGM.

The Secretary-Treasurer reported that he had informed the Proprietor of the Court House Hotel-Motel, Jamieson that the expected number of members attending would be about 80.

(f) Newsletter Review of Books.

The President reported that he had received a review of Dr. A. Weatherly's book but that the review of John Lake's book had not yet come to hand.

(g) Preparation of Papers for Bulletin.

The Secretary-Treasurer reported that he had advised all members of the requirements adopted by the Committee in relation to the preparation of manuscripts and their submission for publication.

(h) Letter to Tasmanian National Parks & Wildlife Service.

The Secretary-Treasurer reported that this letter had been referred to the Editor of the Newsletter for inclusion in the next issue.

(i) Letter from Lake Pedder Action Committee.

The Secretary-Treasurer reported that he had written to the Lake Pedder Action Committee enclosing the 10:2 issue of the Newsletter and drawing attention to the Society's views as expressed in the Newsletter.

- (j) International Association for Water Pollution Research.

The Secretary-Treasurer reported that he had paid the annual subscription of \$20 for the Society's membership on the Australian National Committee of the International Association for Water Pollution Research.

- (k) Arrangements for AGM.

The Secretary-Treasurer reported that he had circulated all members giving information on the Jamieson AGM and requesting advice on accommodation and presentation of papers.

6. Correspondence:

- (a) Letter from Border Ranges Preservation Society.

The Secretary-Treasurer said that he had received a small booklet from the Border Ranges Preservation Society which gave some details of a proposed Tweed Range National Park and details of plans for preservation of Lever's Plateau. It was resolved that the material should be forwarded to Dr. Edgar Riek for his views on the matter.

- (b) Letter from Australian National Advisory Committee for UNESCO.

The Secretary-Treasurer read a letter from the above organisation advising of a symposium entitled 'The Impact of Human Activities on Coastal Zones' to be held in Sydney from the 9th - 11th May. After discussion the Secretary-Treasurer was asked to contact Dr. Francois and discuss with him the possibility of a member of his staff (who is also a Society member) representing the Society at the symposium.

- (c) Letter from Dr. Martin re increase in membership fees.

The Secretary-Treasurer read a letter from Dr. Martin which questioned the procedures whereby the Society had increased its membership fees. It was agreed that the Constitutional legality of the situation should be investigated by Dr. McMichael and that he would prepare a draft statement on all aspects of the matter for the next Executive Committee meeting. It was agreed that the President should, in the meantime, reply directly to Dr. Martin on the points raised.

7. General Business:

(a) The Bulletin.

Dr. Hiscock said the Bulletin had not yet appeared because of extraordinary problems at the Monash printery. Although the Society is committed to making some payment to the printery for the work they did, Dr. Hiscock had taken the project from them and commissioned another firm, Charles E. Tully of Huntingdale, to complete the production of the Bulletin using off-set printing. The Committee examined samples of off-set printing by the Huntingdale printery and fully endorsed Dr. Hiscock's action.

(b) Annual General Meeting.

Some time was spent in finalizing a timetable for the Congress. The Secretary-Treasurer reported that an original plan of hiring a large ferry to take all members from Jamieson to Eildon was no longer possible because the level of Lake Eildon had fallen substantially. The Committee resolved that the trip from Jamieson to Snobs Creek should be by bus both ways. It was agreed that a fairly complete timetable of events should be included in the next Newsletter.

(c) Australian Journal of Marine and Freshwater Research.

The President informed members of the Society about matters concerning the possible future role to be played by the Australian Journal of Marine and Freshwater Research. He brought to the attention of members of the Society the fact that a proposal had been put forward that a nominee of the Society be on the Advisory Committee to the Journal. He also spoke about the need to support the Journal with Australian work. The attention of members was directed to the acceptability of short papers to the Journal and the provision now of 200 reprints for each paper.

8. Date of Next Meeting:

It was agreed that the next Executive Committee meeting should be at 9 p.m. on the 11th May at Jamieson.

J.C.F. WHARTON
Secretary-Treasurer.

AUSTRALIAN SOCIETY FOR LIMNOLOGY

Minutes of the Sixth Executive Committee Meeting
Held at Jamieson on the 11th May 1973.

1. Present:

Mr. G. Arnott, Dr. D.D. Francois, Mr. M. Geddes, Dr. I.D. Hiscock, Mr. D.D. Lynch, Dr. D.F. McMichael, Mr. H. Midgley, Mr. N. Ruello, Mr. R. Tilzey, Mr. J.C. Wharton (Secretary-Treasurer) and Dr. W.D. Williams (President).

2. Apology:

Dr. S.M. Veal

3. Confirmation of Minutes:

(a) Directory.

Mr. Arnott said that the Directory was now at the printer and that he expected it to be completed next week - Noted.

(c) The Jolly Award.

Mr. Tilzey presented a mock-up of a certificate embodying the Committee's ideas for the Jolly Award. There was considerable discussion and a clear feeling emerged that the certificate should convey an impression of very high quality and that the lettering might well be embossed and that enamel ink might be used. It was resolved that a minute of appreciation for Mr. Tilzey's work should be recorded and that the certificate he prepared should be referred to Dr. Hiscock and Mr. Arnott for further consideration and development.

(d) Proposed Tweed Range National Park

The Secretary-Treasurer reported that he had forwarded the proposal by the Border Ranges Preservation Society to Dr. E. Riek for his views. - Noted.

- (e) Symposium entitled 'The Impact of Human Activities on Coastal Zones'.

The Secretary-Treasurer reported that he had contacted Dr. Francois on this matter and that the Society had been represented at the Symposium. - Noted.

- (f) Letter from Dr. Martin re increase in membership fees.

The President said that he had written to Dr. Martin along the lines earlier agreed upon and that Dr. McMichael would later present to the Committee a proposal that would meet the objections raised by Dr. Martin. - Noted.

- (g) Bus trip to Snobs Creek.

The Secretary-Treasurer reported that he had arranged with a bus company from Mansfield to hire two buses for the trip to Snobs Creek and return. He said that the cost would be \$176. It was resolved that everyone who visited Snobs Creek should be charged \$2 in order to defray the cost of the bus trip.

- (h) The Bulletin.

Dr. Hiscock reported that Bulletin No. 5 was with the printer and that it would be completed within a short time. He expressed disappointment that the many problems associated with this Bulletin had not allowed its printing to be in time for issue prior to the AGM. Dr. Hiscock proposed a number of changes for the Bulletin in future. He suggested that AGM proceedings should become a very minor part of the Bulletin and that it should no longer contain reference to papers by Title only. The Committee accepted Dr. Hiscock's recommendations and resolved that they be placed before the AGM with a view to instructing the incoming Editorial Committee accordingly.

- (i) Constitutional Changes.

Dr. McMichael distributed copies of a proposed revised Constitution for the Society in order to provide for the new category of Sustaining Member; the reversion of the period of the subscription year of the Society to July 1 to June 30 and to clarify certain of the existing provisions of the Constitution without significantly altering their nature. The second of these proposed changes would cater for the matter raised by Dr. Martin.

The proposed revised Constitution was discussed at length and with minor changes, was adopted by the Committee. It was resolved that the amended version of the Constitution proposed by Dr. McMichael should be recommended for adoption to the AGM.

6. General Business:

(a) Venue for 13th AGM.

Mr. Midgley produced documents supporting a proposal that the 13th AGM should be held at Suncoast Via Nambour, Queensland. After considerable discussion it was resolved that a recommendation be made to the AGM that the incoming Executive Committee be instructed to examine the practicability of holding the AGM at Suncoast and that Mr. Midgley's supporting papers should be carefully examined. It was further resolved that Canberra should be considered as an alternative Venue if Suncoast was found to be unsatisfactory.

The President closed the meeting and thanked members for their attendance and for their work during the year.

J.C.F. WHARTON

Hon. Secretary-Treasurer.